Reviewing the content and design of anaphylaxis management plans published in English

Article (Accepted Version)

Reviewing the content and design of anaphylaxis management plans published in English

RD Mercer, BM BS [a]; Christina J Jones, PhD [a], Helen E Smith, DM [ab]

[a] Division of Primary Care, Brighton & Sussex Medical School, Mayfield House, University of Brighton, BN1 9PH, United Kingdom

[b] Family Medicine and Primary Care, Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore 308232

r.mercer1@uni.bsms.ac.uk; c.jones@bsms.ac.uk; H.E.Smith@ntu.edu.sg

Correspondence to: Christina Jones, Royal Alexandra Children's Hospital, Level 6, Room 601, Eastern Road, Brighton, BN2 5BE. E: c.jones@bsms.ac.uk T: +44 (0)1273 696955 x 2540

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Abstract

Abstract

Background: Guidelines recommend that patients at risk of anaphylaxis are given an anaphylaxis management plan (AMP) providing advice on symptom recognition and emergency management. However, the format and content of plans is not standardised.

Objective: To review the design and contents of different AMPs available in English.

Methods: A systematic internet search identified AMPs published online. Each plan was analysed for design and content (including signs and symptoms indicative of anaphylaxis and the actions to be taken). The content was compared with a Delphi derived statement of the key characteristics of an AMP.

Results: The systematic search identified 41 plans from 29 different sources. The majority of plans identified were personalised management plans for individuals (78%), the others were designed for institutions. Most AMPs addressed both mild/moderate and severe allergic reactions and had different instructions related to the degree of severity. Thirty seven individual symptoms were mentioned as indicators of anaphylaxis. Only 55% of plans that recommended the administration of an adrenaline auto-injector gave further instructions on how to do this. Only 17% of plans contained comprehensive instructions on safe patient positioning.

Conclusions: There are a wide variety of AMPs in English available online. Plans are similar in design, but differ in content. None of the currently available plans contain all the desirable components recommended in the literature. Because of the variation between plans, when practitioners are selecting an AMP for their patient they need to be attentive to the content of the plan and its appropriateness for that individual.

Key Words: anaphylaxis, allergy, management, plan, content, design

What is already known about this topic?

Anaphylaxis management plans (AMPs) are recommended for all patients in international guidelines and there are a number of plans published globally. Past research has recommended components to be included in AMPs.

What does this article add to our knowledge?

Forty-one plans were identified and had their design and content catalogued. No plans contained all previously recommended components. Other key instructions to patients were missing from plans regarding auto-injector usage and patient positioning.

How does this study impact current management guidelines?

Clinicians must be selective in choosing the optimal AMP for their patients. Clinicians should be aware that currently available AMPs do not include all recommended components. Future plans should consider including patient positioning guidance.

Abbreviations:

AAI	**Adrenaline auto-Injector**
AMP	**Anaphylaxis management plan**
CNS	**Central nervous system**
CV	**Cardiovascular**
EAACI	**European Academy of Allergy and Clinical Immunology**
GI	**Gastrointestinal**
RCPCH	**Royal College of Paediatrics and Child Health**
WAO	**World Allergy Organisation**

List of Figures

List of Tables

Introduction

International (e.g. WAO), regional (EAACI) and national guidelines (RCPCH) recommend patients at risk of anaphylaxis are provided with adrenaline auto injectors (AAIs) together with written instructions describing how, and when, to administer them. Although there are many anaphylaxis management plans (AMPs) available they are not universally employed. A survey published in 2008 reported that 64% of 1,885 patients who had suffered probable anaphylaxis in the community did not possess a written AMP.[1]

Whilst there is no grade A evidence for the use of AMP, their use is supported by two case series demonstrating a reduced number of severe allergic episodes in patients provided with a written AMP as part of a wider training and education program.[2, 3] In addition the possession of a written AMP has been shown to be associated with better adherence to self-care behaviours in adolescents.[4] The ideal content of an AMP was developed in 2010 in the UK using an e-Delphi approach[5] where 26 experts in allergy were contacted for their opinions by email. All responses were collated and then returned to the expert panel in an anonymous format. The next stage involved voting on their agreement with each of the opinions proposed in the first round. This study reported 12 recommended components to be included in AMPs, these were agreed by ≥80% of the panel of experts.

Methods

To identify AMPs a systematic search of the internet was carried out between November 2015 and January 2016. The search strategy is summarised in Table OR1 in the Online Repository. Each term was searched for individually. The first 100 results from each of the five search terms used, sorted by the search engine's measurement of relevance, were screened for inclusion. The initial screening identified whether the title of the web matched inclusion and exclusion criteria. Results continued to be screened beyond 100 until ten consecutive page titles were excluded as not being relevant.

Our search focused on countries where a large proportion of the population spoke English as their first language and there was a healthcare system that includes specialist allergy services: Australia, Canada, New Zealand, Republic of Ireland, South Africa, United Kingdom, and United States of America.

The most frequently visited search engine for each country was used, based on Alexa® web traffic ranking. This uses a sample of millions of internet browsers to estimate popularity. In all seven cases the dominant search engine was the regional variant of Google®

Identified websites were examined thoroughly. Where websites had an internal search facility, this was used with the terms “anaphylaxis” and “plan” to find relevant pages. In addition to locating management plans published on identified websites, each site was searched for links or reference to websites not previously located. In the event that a website required a username and password to access content, wherever possible an account was created and used. If plans were located but not accessible the website administrator was contacted to request a copy.

A data extraction form was designed to capture all symptoms mentioned, instructions given, and other written components in addition to design elements. The form was piloted on six plans and revised before being used to review the remaining plans. Any unexpected characteristics encountered were noted and added to the data extraction form before the AMPs were assessed for a second time. These results were presented descriptively together with an analysis of how many of the twelve e-Delphi study recommended components were included in each AMP.

Results

The systematic search identified 284 websites to review, 29 of these websites published AMPs and seven published multiple versions – resulting in 41 distinct AMPs in total. Eleven plans originated from the U.K., ten from both Canada and the U.S., four from both Australia and Ireland, and one from South Africa. Another plan was identified from a secondary source, a website that publishes management plans in 16 different languages, including English. Information about the origin of each plan and the access details are available in Table OR2 in the Online Repository.

Origins of management plans

The majority of plans (24/41, 59%) were published by charities or non-governmental organisations. Six plans (15%) were published by primary or secondary healthcare providers and six (15%) were published by education authorities or schools. The remaining five plans (12%) were published by care providers/community organisations, pharmaceutical companies, public or regional health bodies or private individuals.

Thirty-two plans (78%) were designed for an individual. The others were to be applied to any person suffering anaphylaxis within an institution (for example, in a school setting the AMP could be used for any pupil). Sixteen plans (39%) were specifically designed to be used in schools. The 32 plans (78%) for individuals contained space to record a range of variables about the patient. The prevalence of these is shown in Table i.

Twenty-four plans (59%) included a year of publication. Nine (22%) were published in 2014-2015, eight (20%) between 2012-2013, five (12%) between 2010 and 2011 and the remaining two (5%) in 2009. Only seven plans (17%) included any indication of version number.

Design

The plans were all A4 or Letter sized, 24 (59%) were single side, whilst 15 (37%) were two sides in length. Two plans were longer, covering four and five sides respectively.

The plans commonly featured logos and visuals demonstrating auto injection, but only two plans (5%) used other graphics. Nineteen plans (46%) were published in full colour versus greyscale. The mean word count was 453 words (range: 183 – 1,664), with plans designed for individuals containing fewer words than plans designed for institutions ($p=0.048$). The mean word count per page was 327 words (range: 199-1664) with plans designed for institutions having more words per page ($p=0.013$).

Information recorded about the plan and the patient

Advice on preventing anaphylaxis

Seventeen plans (41%) contained information aimed at reducing the risk of anaphylaxis or instructions on what to carry in anticipation of a reaction. These instructions are shown in Table ii. Four plans, all of which were designed for institutions, contained more detailed instructions for the day-to-day management of at-risk individuals as well as emergency management plans.

Symptoms discussed

Across all plans a total of 37 distinct symptoms or signs relating to anaphylaxis were mentioned. These could be categorised by systems; central nervous system (CNS), cardiovascular (CV), gastrointestinal (GI), respiratory system, dermatological and other.

The most frequently mentioned symptom category across all plans were respiratory, followed by GI or dermatological effects.

Frequently plans made some distinction between signs or symptoms that were indicative of a mild/moderate and those that were severe, and recommended different actions accordingly (26, 63%). Two plans (5%) advised that multiple mild symptoms from more than one body system should be considered a severe reaction. Fifteen symptoms (37%) were classified as mild in some plans and severe in others. These symptoms were mapped to the grading system published by the WAO for subcutaneous immunotherapy reactions[6]. This system attempts to grade reactions into four groups of increasing severity. Of the 37 identified symptoms in AMPs, 23 are included in the WAO grading system. Those that were not explicitly included related to young children or were symptomatic manifestations of underlying pathology (for example 'dizziness' in our data would probably be included in "Hypotension with or without loss of consciousness" in the WAO grading). This reflects the difference in target audience; AMPs are designed for lay people whilst the WAO system is for health professionals.

The overall prevalence and severity classification for each symptom identified is recorded in Figure 2. This shows that there was broad agreement between AMPs as to which symptoms considered mild and which severe. The classification of severity closely reflected the WAO grading of severity, with a few exceptions. These were nausea and vomiting (normally considered mild in AMPs, classified as a grade 2 reaction in the WAO system) and coughing

(considered Grade 1 in the WAO system but considered severe in all plans that made the distinction between mild and severe).

Three plans (7%) contained space for patients to record additional symptoms if they experienced symptoms of anaphylaxis not already listed.

The trigger for action varied between plans. In 18 plans (44%) patients were instructed to take action if they recognised *any one* severe symptom. Nine plans (22%) advised patients to monitor for worsening symptoms, with the same number cautioning that symptom progression may be rapid. Four plans, from Australasia and South Africa, gave specific information for insect allergic patients - upgrading mild GI symptoms to severe.

The mean number of symptoms mentioned per plan was 19 (range: 11-27).

Actions to take

Actions to be taken in the event of an allergic reaction were varied, but fell broadly into two categories: direct instructions to the patient or bystander and supporting information. The prevalence of these instructions and information supporting them are recorded in Table iii.

Half of all plans (51%) recommended giving antihistamines. All plans recommended that when symptoms indicated a severe reaction an ambulance should be called. Plans recommending a second dose of adrenaline varied in recommended interval between injections. Fifteen plans (50%) recommended 5 minutes, 14 (47%) gave a range of between 5-15 minutes, whilst one plan advised after “a few minutes or more”.

Additional supporting information printed on plans included the ambulance phone number for the relevant geographic area, a recommendation for transport to hospital for further observation and reassurance to patients/bystanders that if there is doubt it is better to use the AAI than not.

Eight plans (20%) advised taking a second dose of any medications vomited. One plan gave opposing advice, instructing patients and bystanders *not* to repeat the dose if the patient vomits.

Three plans provided a section for the recording of the allergens a patient is “extremely reactive” to, two advised that an AAI be administered for any one symptom mentioned in this case. All three of these plans also advised that an AAI be used after any possible exposure to an extremely reactive allergen *even if the patient is not symptomatic*.

Auto-injector instructions

Thirty-eight plans (93%) contained an instruction to administer an AAI to the patient. Two of the plans that did not contain this instruction were U.K. plans designed for patients not prescribed an AAI. One, however, was an institutional anaphylaxis plan for school use in the United States.

Despite the high proportion of AMPs instructing patients to administer an AAI, only 55% of plans that mandated the delivery of the injection included any instructions on how to do so.

Instructions were identified for nine individual types of AAI, in addition to instructions for using drawing up adrenaline from a vial using a needle and syringe (see Online Repository Figure 1).

Five plans gave instructions for different brands in one document.

Asthma advice

Fifteen plans (37%) had the option to record asthma explicitly available, whilst 12 (29%) contained space to record details of asthma medication.

Within the actions to take section of plans, 16 plans (39%) instructed responders to give asthma inhalers. Five plans (12%) instructed responders to deliver an AAI if they were unsure whether the patient was having an asthmatic or anaphylactic attack.

Miscellaneous

The facility to record the brand and dosage of AAI device prescribed was infrequently included AMPs, appearing in 11 (27%) and 13 (32%) plans respectively. Space to record the expiry date of the device was rare, being found in only two plans (5%).

Some plans were adapted for children. Three plans (7%) recorded whether a child was capable of self-administering and two (5%) provided information on whether the child carried their AAI on their person. A further two plans (5%) gave details of staff members who have received training in anaphylaxis management. Three plans (7%) gave advice on what to document after an anaphylactic episode.

Presence of recommended components

No plan included all of the items recommended by experts participating in the consensus e-Delphi study.[5] The most commonly omitted elements were where the medication is stored, the review and expiry dates of medications, the number of AAIs to be carried and a list of who

in the patient's environment is trained to use them. The median number of recommended components present in the plans reviewed was four, from a maximum of ten possible.

The plan that came closest to including all of the recommended features was a plan designed for institutions published by Northcott, an Australian not-for-profit disability care provider (plan no. 39, table OR2); this included nine out of ten recommendations. There was also a plan containing eight of the recommended components, this was also intended for institutional use and published by the Illinois State Board of Education (plan no. 32). Each recommended component from the e-Delphi study is listed and cross referenced against the plans we identified in table OR3 in the online repository.

Discussion

We found 41 different management plans, all of broadly similar designs: text based instructions formatted as bullet points, often within one or two sides of A4 paper. This reflects their need to contain quickly accessible information in an emergency. The majority are designed for individuals. Others are designed for institutions, for example schools. Most plans were clearly designed as emergency action plans providing life-saving rather than day to day or preventative advice and all instruct to summon further professional help during a reaction.

Presence of recommended components

The two plans that contained the largest number of recommended components were both designed for institutions. This may reflect that it easier to include all the recommendations when the target environment for use is limited and defined (e.g. within a school). Alternatively, it may indicate that plans for individuals consider some of these recommendations irrelevant in an emergency – for example review dates of medication doses. The plans we identified overwhelmingly focussed on emergency management rather than day to day management. Previously recommended components such as including the number of AAIs to carry may be more suited to everyday management plans than emergency management plans.

It was not possible to assess whether for drug allergies both generic and proprietary names were recorded along with any cross sensitivities (as recommended), as these would be filled in at the time of the plans completion rather than printed onto the template. However, it was noted that no plans included instructions to record this level of detail. Indeed, no identified

plan was published alongside supporting instructions for the person completing the document, although guidance may be provided within clinical settings.

There is variation in which symptoms are mentioned for patients to identify anaphylaxis and also in the actions that patients are advised to take to treat anaphylaxis. However, most plans split responses into mild/moderate reactions and severe reactions. Where this division is not made within plans, it is often because a publisher produces separate documents for mild/moderate and severe reactions. The AMPs that contained two 'pathways' presented this information clearly within the space constraints. There is broad agreement as to which symptoms are considered severe, with particular attention given to respiratory and cardiovascular effects.

Discrepancies between plans

Several instructions or statements were included in a very small proportion of plans. Three gave the option or recording allergens that a patient is "severely" reactive to. These plans instructed patients who may have been exposed to these allergens to inject adrenaline even if not symptomatic. Similarly, two plans advised AAI use for more than one symptom they considered minor. The evidence base for these recommendations was not immediately clear.

Recommendations for future plans

By comparing the AMPs already in print in addition to the literature surrounding the topic we are able to suggest important features that are not widely published in existing AMPs.

As discussed previously, most of the plans identified in the study time frame contain less than half of the features agreed as important by a consensus of experts in the field. When revising plans, publishers should be aware of this research and consider whether it is possible to include more of the components whilst maintaining a document that is easy for patients and bystanders to read in a crisis.

Plans should include brand specific instructions on how to use their AAI. This may reduce the number of patients using incorrect technique for their AAI despite prior training, 84% of 102 patients in a 2015 study.[7] Similarly, few plans instructed patients to always carry their AAI. This may be attributed to publishers considering this behaviour to be common sense. However, several case series exist indicating that in fatal episodes of anaphylaxis contributing factors included delay in adrenaline administration resulting from prescribed AAIs not being

readily available.[8-11] It is also known that overall rate of carriage of AAIs by adolescents is low, but having a written AMP improves adherence to self-care behaviours including the carriage of AAIs. [4]

Plans currently give times to wait between doses as a range. This is to be expected given the paucity and low grade of evidence for the optimal gap between doses and reflects current guidelines from the World Allergy Organisation (WAO).[12, 13] However, we suggest that giving a range introduces unnecessary ambiguity for lay-responders and that further research into this area may be beneficial.

A greater focus should be given to patient positioning, which is a core element of first aid for any condition. Plans should include the three instructions given in European and WAO guidelines for the emergency treatment of anaphylaxis.[12, 13] Similarly, further attention may be beneficial for patients with co-morbid asthma. These patients, particularly children, are at higher risk of death from anaphylaxis.[9, 10, 12] This includes case reports where anaphylaxis has been confused with life threatening asthma.[14, 15] Some plans clearly specified if the responder was unsure if the reaction was asthma or anaphylaxis to give the AAI, this is an instruction that could be included more widely.

After the search period had concluded, a major new AMP was published by the American Academy of Pediatrics[16]. This plan was a plan for individuals designed specifically for children. It contained no novel components that had not previously been identified in our review and included six of the components recommended by the e-Delphi study. Like many other plans, it did not instruct patients on how to give an adrenaline injection. This highlights that there are a wide range of institutions producing management plans and, despite new versions being released, there is little difference in their content.

Limitations

This study systematically identified and analysed anaphylaxis management plans, to identify both common and unique features within them. By using inclusive search criteria and the internet we identified 29 additional resources to those found in a previous study that confined its search to peer reviewed publications.[17] Inevitably not all AMPs will have been identified as others may only be available to clinicians on their institutional intranets, for example. Our search methodology would also have not identified AMPs published in novel formats, for example smartphone apps that allow patients to create their own personalised treatment plan

by answering questions. The eDelphi consensus findings used as a 'gold standard' in this study was derived from experts from the UK and Ireland only, it would have been preferable if the 'gold standard' had been derived from panellists working internationally.

Further research

To date there have been no randomised control trials demonstrating the overall effectiveness of anaphylaxis management plans (AMPs).[18] This is in contrast to the personalised management plans recommended in guidelines for asthma, which is supported by extremely strong (Grade A) evidence.[19] In both adults and children, having a written management plan for asthma has been shown to reduce hospital admissions and minimize the effect of symptoms on daily living.[20-22] The evidence has been pooled in a meta-analysis to identify which individual components of these plans provide the most benefit to patients with asthma.[23]

This study provides a comprehensive assessment of the components and design of AMPs published in the English language. This overview highlights to practitioners the variation between plans and encourages them to consider the individual patient's needs and seek a plan that is best suited for them.

Improving the content of management plans for anaphylaxis has to date focused on the preferences of allergy specialists. However, we also need to be attentive to patients' opinions also, and so co-design activities are needed. Combining these two perspectives using co-design methodology would bring us closer to the 'optimal' management plan. The need for formal evaluation of AMPs is controversial; previous calls for a randomised control trial of management plans in anaphylaxis have not been universally supported. Some argue that AMPs are such a low cost and low risk intervention, that research endeavours in this area are an unnecessary use of research time and funding. Furthermore, as anaphylaxis is a potentially fatal condition there are significant ethical questions raised should the comparator be no management plan.[22] Conversely it can be argued that current best practice already includes the provision of an AMP but adherence to self-care behaviours remain very poor, and so studying interventions that improve self-management are worthy of attention. The best way forward would be the design and evaluation of complex interventions, combining the AMP with patient education and/or allocation of an anaphylaxis buddy and/or membership of a

294 patient support organization. With several interacting components, one design a preference
295 trial or a randomized consent trial.

References

1. Simons FE, Clark S, Camargo CA, Jr. Anaphylaxis in the community: learning from the survivors. J Allergy Clin Immunol. 2009;124(2):301-6.
2. Ewan PW, Clark AT. Efficacy of a management plan based on severity assessment in longitudinal and case-controlled studies of 747 children with nut allergy: proposal for good practice. Clin Exp Allergy. 2005;35(6):751-6.
3. Clark AT, Ewan PW. Good prognosis, clinical features, and circumstances of peanut and tree nut reactions in children treated by a specialist allergy center. J Allergy Clin Immunol. 2008;122(2):286-9.
4. Jones CJ, Llewellyn CD, Frew AJ, Du Toit G, Mukhopadhyay S, Smith H. Factors associated with good adherence to self-care behaviours amongst adolescents with food allergy. Pediatr Allergy Immunol. 2015;26(2):111-8.
5. Worth A, Nurmatov U, Sheikh A. Key components of anaphylaxis management plans: consensus findings from a national electronic Delphi study. JRSM Short Reports. 2010;1(5):42.
6. Cox L, Larenas-Linnemann D, Lockey RF, Passalacqua G. Speaking the same language: The World Allergy Organization Subcutaneous Immunotherapy Systemic Reaction Grading System. J Allergy Clin Immunol. 2010;125(3):569-74, 74 e1-74 e7.
7. Bonds RS, Asawa A, Ghazi AI. Misuse of medical devices: a persistent problem in self-management of asthma and allergic disease. Ann Allergy Asthma Immunol. 2015;114(1):74-6 e2.
8. Pumphrey RS. Lessons for management of anaphylaxis from a study of fatal reactions. Clin Exp Allergy. 2000;30(8):1144-50.
9. Xu YS, Kastner M, Harada L, Xu A, Salter J, Waserman S. Anaphylaxis-related deaths in Ontario: a retrospective review of cases from 1986 to 2011. Allergy Asthma Clin Immunol. 2014;10(1):38.
10. Munoz-Furlong A, Weiss CC. Characteristics of food-allergic patients placing them at risk for a fatal anaphylactic episode. Current allergy and asthma reports. 2009;9(1):57-63.
11. Bock SA, Munoz-Furlong A, Sampson HA. Fatalities due to anaphylactic reactions to foods. J Allergy Clin Immunol. 2001;107(1):191-3.
12. Simons FE, Ardusso LR, Bilo MB, El-Gamal YM, Ledford DK, Ring J, et al. World allergy organization guidelines for the assessment and management of anaphylaxis. The World Allergy Organization journal. 2011;4(2):13-37.
13. Muraro A, Roberts G, Worm M, Bilo MB, Brockow K, Fernandez Rivas M, et al. Anaphylaxis: guidelines from the European Academy of Allergy and Clinical Immunology. Allergy. 2014;69(8):1026-45.
14. Rainbow J, Browne GJ. Fatal asthma or anaphylaxis? Emerg Med J. 2002;19(5):415-7.
15. Sargant N, Erlewyn-Lajeunesse M, Benger J. Does anaphylaxis masquerade as asthma in children? Emerg Med J. 2015;32(1):83-4.
16. American Academy of Pediatrics. Allergy and anaphylaxis emergency plan [online]. 2017 [Available from: https://www.aap.org/en-us/Documents/AA-EmergencyPlan.pdf].
17. Nurmatov U, Worth A, Sheikh A. Anaphylaxis management plans for the acute and long-term management of anaphylaxis: A systematic review. J Allergy Clin Immunol. 2008;122(2):353-61.e3.

18. Choo K, Sheikh A. Action plans for the long-term management of anaphylaxis: systematic review of effectiveness. Clin Exp Allergy. 2007;37(7):1090-4.
19. British Thoracic Society Scottish Intercollegiate Guidelines N. British Guideline on the Management of Asthma. Thorax. 2008;63 Suppl 4:iv1-121.
20. Gibson PG, Powell H, Coughlan J, Wilson AJ, Abramson M, Haywood P, et al. Self-management education and regular practitioner review for adults with asthma. The Cochrane database of systematic reviews. 2003(1):CD001117.
21. Bhogal S, Zemek R, Ducharme FM. Written action plans for asthma in children. The Cochrane database of systematic reviews. 2006(3):CD005306.
22. Zemek RL, Bhogal SK, Ducharme FM. Systematic review of randomized controlled trials examining written action plans in children: what is the plan? Arch Pediatr Adolesc Med. 2008;162(2):157-63.
23. Gibson PG, Powell H. Written action plans for asthma: an evidence-based review of the key components. Thorax. 2004;59(2):94-9.
24. Simons FE. Pharmacologic treatment of anaphylaxis: can the evidence base be strengthened? Curr Opin Allergy Clin Immunol. 2010;10(4):384-93

362 *Table i: Prevalence of customisation options within plans for individuals only*

Item	**Number of plans including item (n,%)**	
Full name of the patient	32	100%
List of known allergens	32	100%
Contact details for emergencies	30	94%
Plan signed by doctor	27	84%
Date that plan was completed	26	81%
Date of birth	22	69%
Photograph of patient	21	66%
Plan signed by parent	14	44%
Contact details for doctor	14	44%
Weight	8	25%
Plan signed by school representative	4	13%
Name of class or teacher	4	13%
Planned review or expiry date of plan	3	9%
List of allergens *extremely* reactive to	3	9%

363

364

365

366 *Table ii: Advice given before anaphylaxis occurs*

Recorded characteristic	**Number of plans including characteristic (n, %)**	
Instruction to carry auto injector at all times	7	17%
Advice to inform close contacts about the existence of the plan	6	15%
Instruction to avoid known triggers	4	10%
Instruction to wear medic alert bracelet or similar	4	10%
Instruction to carry more than one auto-injector	3	7%

367

368

369

370 Table iii: Prevalence of actions to take

371

Recorded characteristic	*Number of plans including characteristic (n, %)*	
Phone ambulance	41	100%
Contact family or emergency contact	39	95%
Give auto injector	38	93%
Ambulance phone number for territory	38	93%
Give further dose of adrenaline if no response	30	73%
Stay with patient	25	61%
Lay patient flat	24	59%
Transport to hospital for ongoing observation	22	54%
Give antihistamines	21	51%
Words to the effect of "if in doubt, give the auto injector"	17	41%
If breathing is difficult allow to sit	15	37%
Call for help (audibly to attract nearby people rather than by phone)	14	34%
Give other medications with space for medications to be entered (excluding specific asthma medications or antihistamines)	12	29%
Do not allow to stand or walk	12	29%
Locate auto-injector	11	27%
Recommendation for length of time to be observed in hospital	11	27%
Start CPR if unresponsive or abnormally breathing	10	24%
Words to the effect of "do not depend on antihistamines"	7	17%
Remove insect stings by flicking	4	10%
Do not remove ticks	3	7%
Stay calm	2	5%

372

373

374

375

376

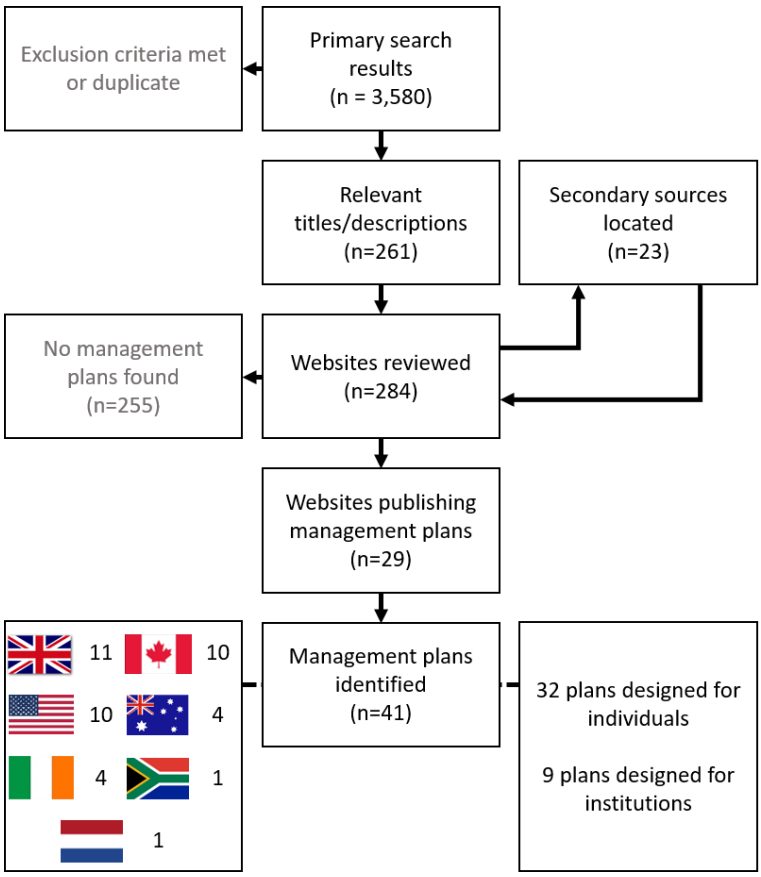


Figure 1: Flow chart showing identification of sources

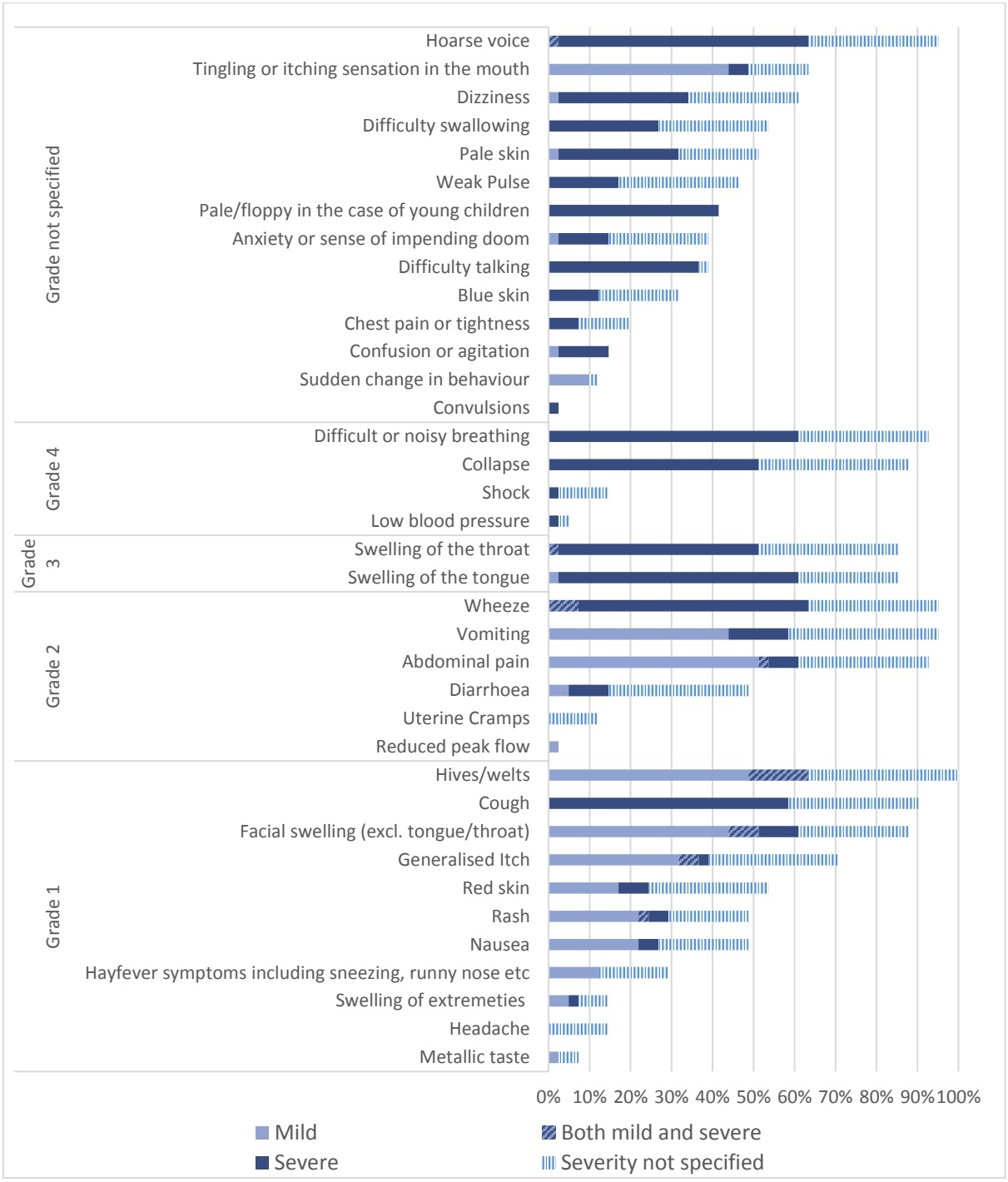


Figure 2: Frequency of symptoms mentioned on the AMP and whether classified as mild or severe

Search Term	Phrase
1	Allergy
2	Anaphylaxis
3	Food allergy
4	Anaphylaxis management plan
5	Adrenaline auto-injector

Inclusion criteria	Exclusion Criteria
Website title or description relevant to initial search terms	Website title/description describes a veterinary page
Website title and description in English language	Website title/description describes an online shop-front or retailer
	Website tittle/description clearly irrelevant to initial search terms

385

386 Table OR1: Search strategy employed to locate management plans

387

388

389 OR2: List of AMPs identified

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
1	Allergic Reaction Toolkit	United States	Charity, NGO	-	5	https://www.allergicreactiontoolkit.com/-/media/allergic%20reaction%20toolkit/files/anaphylaxis_emergency_care_plan.pdf
2	Allergy Asthma Information Association	Canada	Charity, NGO	2014	1	http://www.aaia.ca/en/anaphylaxis_brochure_en.pdf
3	Allergy South Africa	South Africa	Charity, NGO	-	4	http://www.mm3admin.co.za/documents/docmanager/8e7be0a4-2b8d-453f-875e-cd1e5132b829/00035820.pdf
4	American Academy of Allergy Asthma and Immunology	United States	Charity, NGO	2013	4	http://www.aaaai.org/Aaaai/media/MediaLibrary/PDF%20Documents/Libraries/Anaphylaxis-Emergency-Action-Plan.pdf

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
5	Anaphylaxis Ireland	Republic of Ireland	Charity, NGO	-	4	http://www.anaphylaxisireland.ie/wp-content/uploads/2013/01/MCC-broc_web_revDec12-3.pdf
6	Anaphylaxis Ireland	Republic of Ireland	Charity, NGO	-	4	http://www.anaphylaxisireland.ie/wp-content/uploads/2013/01/MCC-broc_web_revDec12-3.pdf
7	Anaphylaxis Netherlands	Other	Charity, NGO	2015	6	*Provided directly by author via email*
8	Asthma and Allergy Foundation of America	United States	Charity, NGO	-	4	http://www.aafa.org/media/Child-Care-Asthma-Allergy-Action-Card.pdf
9	Asthma and Allergy Foundation of America	United States	Charity, NGO	-	5	http://www.aafa.org/media/Anaphylaxis-Emergency-Action-Plan.pdf
10	Asthma, Allergy & Sinus Center	United States	Primary or secondary healthcare provider	-	5	http://paallergy.com/assets/anaphylaxis-treatment.pdf

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
11	Australasian Society of Clinical Immunology and Allergy	Australia	Charity, NGO	2015	7	http://www.allergy.org.au/images/stories/anaphylaxis/2015/ASCIA_Action_Plan_Anaphylaxis_EpiPen_Personal_2015.pdf
12	Australasian Society of Clinical Immunology and Allergy	Australia	Charity, NGO	2015	6	http://www.allergy.org.au/images/stories/anaphylaxis/2015/ASCIA_Action_Plan_Allergic_Reactions_2015.pdf
13	Australasian Society of Clinical Immunology and Allergy	Australia	Charity, NGO	2015	3	http://www.allergy.org.au/images/stories/anaphylaxis/2015/ASCIA_Action_Plan_Anaphylaxis_EpiPen_General_2015.pdf
14	Be Allergy Aware	Republic of Ireland	Charity, NGO	-	1	http://www.beallergyaware.com/upload/Understanding%20Anaphylaxis%20Leaflet.pdf

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
15	British Columbia School Trustees Association	Canada	Educational body/school	2010	4	https://dsweb.bcsta.org/docushare/dsweb/Get/Document-33393/Sample%20Anaphylactic%20Student%20Emergency%20Procedure%20Plan%20-%20June%202010.doc
16	British Society for Allergy and Clinical Immunology	United Kingdom	Charity, NGO	2013	5	http://www.bsaci.org/LiteratureRetrieve.aspx?ID=123699
17	British Society for Allergy and Clinical Immunology	United Kingdom	Charity, NGO	2013	4	http://www.bsaci.org/LiteratureRetrieve.aspx?ID=123701
18	British Society for Allergy and Clinical Immunology	United Kingdom	Charity, NGO	2013	5	http://www.bsaci.org/LiteratureRetrieve.aspx?ID=123700

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
19	British Society for Allergy and Clinical Immunology	United Kingdom	Charity, NGO	2014	5	http://www.bsaci.org/LiteratureRetrieve.aspx?ID=127070
20	Californian School Nurse Association	United States	Educational body/school	-	5	http://www.csno.org/uploads/1/7/2/4/17248852/anaphalaxis_tx_procedures-revised_4.doc
21	Canadian inter agency group	Canada	Charity, NGO	2014	4	http://www.aaia.ca/en/Anaphylaxis_Emergency_Plan_with_EpiPen_instructions.pdf
22	Canadian inter agency group	Canada	Charity, NGO	2014	4	http://www.aaia.ca/en/Anaphylaxis_Emergency_Plan_with_Allerject_instructions.pdf
23	Epi Pen	United Kingdom	Pharmaceutical company	2012	5	http://www.epipen.co.uk/docs/FINAL_234423_EpiPen-action-plan-NGA_070912.pdf

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
24	Food Allergy Research Education	United States	Charity, NGO	2014	4	http://www.foodallergy.org/document.doc?id=234
25	Foods Matter	United Kingdom	Charity, NGO	-	2	http://www.foodsmatter.com/allergy_intolerance/management_all_in_school/articles/waggott-severe-allergy-summary.pdf
26	Foods Matter (Individual Contribution)	United Kingdom	Private individual	-	2	http://www.foodsmatter.com/allergy_intolerance/anaphylaxis/articles/anaphylaxis_action_plan.pdf
27	Guy's and St Thomas' NHS Trust	United Kingdom	Primary or secondary healthcare provider	2011	4	http://www.allergyacademy.org/sites/default/files/resources_uploads/Child_plan1_for_allergic_reactions.pdf
28	Guy's and St Thomas' NHS Trust	United Kingdom	Primary or secondary healthcare provider	2011	4	http://www.allergyacademy.org/sites/default/files/resources_uploads/Child_plan2_for_allergic_reactions.pdf

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
29	Guy's and St Thomas' NHS Trust	United Kingdom	Primary or secondary healthcare provider	2009	4	http://www.allergyacademy.org/sites/default/files/resources_uploads/Child_plan3_for_allergic_reactions_0.pdf
30	Halton Region School Board	Canada	Educational body/school	-	3	http://www.hdsb.ca/ParentInfo/Health%20Protocols/AnaphylaxisProtocol.pdf
31	Harrogate District NHS Trust	United Kingdom	Primary or secondary healthcare provider	2011	5	http://www.staidans.co.uk/wp-content/uploads/2014/12/adrenaline_action_plan.pdf
32	Illinois State Board of Education	United States	Educational body/school	-	8	http://www.isbe.net/nutrition/pdf/food_allergy_guidelines.pdf
33	Irish Food Allergy Network	Republic of Ireland	Charity, NGO	-	6	http://ifan.ie/wp-content/uploads/2013/06/Safety-Plan.pdf

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
34	IWK Healthcare	Canada	Charity, NGO	2013	3	http://www.iwk.nshealth.ca/sites/default/files/PL-0259-Eng-and-FR-DONE-Mar1-2013.pdf
35	Mary H Weiser Food Allergy Center	Canada	Primary or secondary healthcare provider	2013	6	http://medicine.umich.edu/sites/default/files/content/downloads/FAAP%20UM%204_2014.pdf
36	Mission Public Schools	Canada	Educational body/school	2009	3	http://www.mpsd.ca/districtinformation/pdf/procs/AP101-Emergency_Plan.pdf
37	National Association of School Nurses	United States	Educational body/school	2011	2	https://www.nasn.org/portals/0/resources/faat_no_ECP.pdf
38	National Institute of Health and Disease	United States	Charity, NGO	-	5	http://www.niaid.nih.gov/topics/foodallergy/clinical/documents/faguidelinespatient.pdf

ID	Publisher Title	Country of Origin	Organisation Type	Publication or revision date (where specified)	Number of recommended components included	Available from URL
39	Northcott	Australia	Care/Community organisation	-	9	https://www.northcott.com.au/sites/default/files/Anaphylaxis%20Management%20Plan.pdf
40	Prince Edward Island	Canada	Care/Community organisation	-	3	http://www.gov.pe.ca/photos/original/anasept_2006.pdf
41	Winnipeg Regional Health Authority	Canada	Public health/regional health body	2012	3	http://www.pembinatrails.ca/lindenmeadows/Staff/Anaphylaxis%20Handout%202012-04-01.pdf

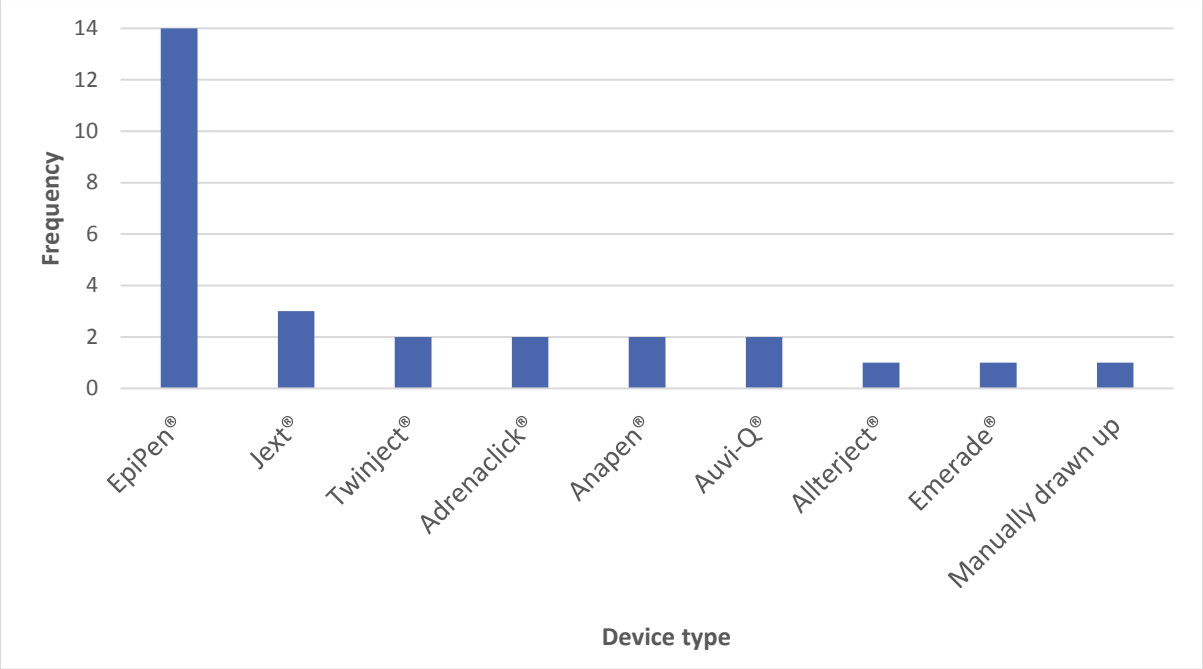
390

391

392

OR3: Table cross-referencing recommended components (over 80% agreement of a panel of 24 UK/Irish experts) with the plans that contain them

Recorded characteristic	**ID Number of plans that contain characteristic (see table OR2)**
Contact details for emergencies	1, 3-4, 7-12, 15-19, 21-24, 26-33, 35-36, 38-39
Details of known allergens	1, 3-12, 15-19, 21-24, 27-33, 35-36, 38-40
How to recognise and respond to mild, moderate and severe allergic reactions	1, 3, 5-7, 11-13, 16-20, 23-25, 27-29, 31-35, 37, 39
List of medication prescribed and instructions on when to use it	1, 4, 7-12, 32, 35, 38-39
Clear statement of the need to administer adrenaline without hesitation	5-7, 9, 11, 13, 16, 18-20, 31-34, 38-39, 41
Instructions to call the emergency services	All
Location where medication is stored	15, 20-23, 32-33, 39-41
Review dates of medication doses (recorded as option to give the plan an expiry date)	11-12, 39
Number of AAIs to carry	10, 20, 35
Who is trained to give medication in the patient's location	32, 39



OR FIG1: Prevalence of AAI instructions by brand